

Roll No.

Total No. of Pages : 02

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**B.Tech.(CE,CSE,EEE,EE,ECE,ME) (Sem-1,2)**  
**ELEMENTS OF MECHANICAL ENGINEERING**

**Subject Code : BTME-101**

**M.Code : 54101**

**Date of Examination : 19-06-23**

**Time : 3 Hrs.**

**Max. Marks : 60**

**INSTRUCTIONS TO CANDIDATES :**

1. **SECTION-A is COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. **SECTION - B & C** have **FOUR** questions each.
3. **Attempt any FIVE** questions from **SECTION B & C** carrying **EIGHT** marks each.
4. **Select atleast TWO** questions from **SECTION - B & C**.

**SECTION-A**

**1. Answer briefly :**

- a) On a hot summer day, a student turns his fan on when he leaves his room in the morning. When he returns in the evening, will the room be warmer or cooler than the neighbouring rooms? Why? Assume all the door and windows are kept closed.
- b) Name and state the property introduced by the first law of thermodynamics.
- c) Distinguish between quasi static process and actual process.
- d) What is a steady flow process?
- e) What are the main conclusions that can be drawn from the efficiency of Carnot cycle?
- f) Write an expression for the air standard thermal efficiency of Otto cycle.
- g) Define polar moment of inertia.
- h) What is the purpose of providing spark plug in S. I. engine?
- i) What are technological properties of materials?
- j) What is the difference between thermoplastic and thermosetting materials?

## SECTION-B

2. What is the essence of first law of thermodynamics? Write down expression for the first law applied to
  - a) cycle.
  - b) process.
3. A certain volume of gas at  $47^{\circ}\text{C}$  and 6.5 bar is expanded to four times its original volume according to  $pV^{1.25}=\text{Constant}$ . Determine the final temperature of the gas and change in entropy per kg gas, assume  $C_p=0.996$  KJ/kg K and  $C_v=0.707$  kJ/kg K.
4. An engine working on the Otto cycle is supplied with air at 1.1 MPa,  $35^{\circ}\text{C}$ . The compression ratio is 8. Heat supplied is 2100 kJ/kg. Calculate the maximum pressure and temperature of the cycle, the cycle efficiency and the mean effective pressure.  
(For air,  $c_p=1.005$ ,  $c_v=0.718$  and  $R=0.287$  kJ/kg K).
5. Explain classification of Engineering materials and characteristics of key engineering materials used in manufacturing.

## SECTION-C

6. Derive steady flow energy equation for a single stream of fluid entering and leaving the control volume.
7. a) **Differentiate between the following :**
  - i) Creep and fatigue
  - ii) Yield stress and proof stress
  - iii) Ductile and brittle fractureb) What are the commercial alloys of aluminum? Briefly describe their composition and uses.
8. List the major factors affecting the selection of materials.
9. Find the centroid of an unequal angle section  $100\text{ mm} \times 80\text{ mm} \times 20\text{ mm}$ .

**NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.**